

WHAT IS CLAIMED IS:

1. An interbody fusion apparatus for implantation in the disc space between adjacent vertebrae to be fused, comprising:

a hollow body having at least two substantially cylindrical portions defining an outer diameter greater than the height of the disc space between the adjacent vertebrae, said at least two substantially cylindrical portions each configured to contact a portion of one of the adjacent vertebrae, said body having a first end and an opposite second end and including an end wall at said first end;

at least one screw bore defined through said end wall, said screw bore defining a longitudinal axis oriented such that said longitudinal axis intersects one of said substantially cylindrical portions; and

a bone screw sized to extend through said at least one screw bore and project outward from one of said substantially cylindrical portions of said hollow body, said bone screw configured to threadedly engage one of the adjacent vertebrae to retain said hollow body within the disc space.

2. The interbody fusion apparatus according to claim 1, wherein:

said at least one screw bore includes an enlarged recess at said end wall; and

said bone screw includes an enlarged head sized to be received within said enlarged recess.

3. The interbody fusion apparatus according to claim 1, wherein:

said hollow body includes two screw bores defined in said end wall, each screw bore defining a longitudinal axis arranged to intersect opposite ones of said at least two substantially cylindrical portions of said hollow body, the longitudinal axes of said two screw bores diverging from each other toward said second end; and

said apparatus includes two bone screws, each sized to extend through a respective one of said two screw bores to threadedly engage a respective one of the adjacent vertebrae to retain said hollow body within the disc space.

4. The interbody fusion apparatus according to claim 3, wherein

each of said two screw bores includes an enlarged recess at said end wall; and

each of said two bone screws includes an enlarged head sized to be received within said enlarged recess.

5. The interbody fusion apparatus according to claim 3, wherein:

said end wall of said hollow body defines a threaded bore between said two screw bores;  
and

said apparatus includes a locking screw configured for engagement within said threaded bore, said locking screw having a head sized to contact each of said two bone screws when said bone screws are extending through a respective one of said two screw bores and when said locking screw is engaged in said threaded bore.

6. The interbody fusion apparatus according to claim 5, wherein  
each of said two screw bores includes an enlarged recess at said end wall;  
each of said two bone screws includes an enlarged head sized to be received within said  
enlarged recess; and  
said threaded bore includes an enlarged recess sized to receive said enlarged head of said  
locking screw therein, said enlarged recess of said threaded bore overlapping said enlarged recess  
of each of said bone screw bores.

7. The interbody fusion apparatus according to claim 1, wherein said at least two  
substantially cylindrical portions of said hollow body include external threads configured for  
threaded engagement with said adjacent vertebrae.

8. The interbody fusion apparatus according to claim 1, wherein said hollow body is  
tapered from said first end to said second end.

9. The interbody fusion apparatus according to claim 1, wherein said hollow body  
defines two opposite substantially flat walls between said at least two substantially cylindrical  
portions.

10. The interbody fusion apparatus according to claim 1, wherein said hollow body defines at least one slot extending through said hollow body and intersecting at least one of said substantially cylindrical portions.

11. The interbody fusion apparatus according to claim 10, wherein said at least one screw bore intersects said at least one slot.

12. The interbody fusion apparatus according to claim 1, wherein:  
said end wall defines a midline and said at least one screw bore is disposed along said midline; and

further wherein said end wall defines a pair of elongated slots offset from and substantially parallel to said midline of said end wall.

13. A driving tool assembly for use with the interbody fusion apparatus of claim 12, comprising:

a driving tool attachment including a body having a mating face and a pair of elongated driving bosses extending from said mating face, said mating face configured to contact said end face of said interbody fusion apparatus and said driving bosses configured to be slidably received within corresponding ones of said elongated slots; and

a driving tool including an elongated shaft for applying a driving force and means at one end of said shaft for engaging said driving tool attachment.

14. A distraction device for distracting the disc space between adjacent vertebrae, comprising:

an elongated stem having a height corresponding to a desired height of distraction for the disc space, said stem having a first end and a second end defining a longitudinal axis therebetween and a length along said axis that is sized to be maintained within the disc space when said elongated stem is driven into the disc space; and

a flange at said first end projecting outward from said longitudinal axis of said stem, said flange having a bone contacting face for contacting at least one of the vertebrae when said stem is driven into the disc space and for transmitting a reduction force to the vertebra upon application of an external force to the distraction device.

15. The distraction device according to claim 14, wherein said elongated stem defines a bore extending between said first and second end.

16. The distraction device according to claim 15, wherein said bore includes a keyed bore adjacent said second end, said keyed bore having a non-circular configuration for receiving a complementary-shaped portion of a tool therethrough.

17. The distraction device according to claim 15, wherein said bore includes a threaded bore adjacent said first end for receiving a threaded portion of a tool therein.

18. The distraction device according to claim 14, wherein said elongated stem has opposite top and bottom portions, said top and bottom portions having a bone engaging surface configured to resist expulsion of said elongated stem from the disc space.

19. The distraction device according to claim 18, wherein said bone engaging surface of said top and bottom portions include a plurality of ridges defined thereon.

20. The distraction device according to claim 18, wherein said elongated stem includes side portions between said top and bottom portions, said side portions each defining an inwardly curved surface.

21. The distraction device according to claim 18, wherein said flange includes inwardly curved side edges contiguous with said inwardly curved surface of a corresponding one of said side portions.

22. The distraction device according to claim 14, wherein said flange is fan shaped and is substantially perpendicular to said longitudinal axis of said elongated stem.

23. The distraction device according to claim 14, wherein:  
said elongated stem includes opposite top and bottom surfaces configured to contact a

superior and an inferior vertebra, respectively;

said flange projects from said stem in a direction toward the superior vertebra; and

the device includes a stop face at said first end of said stem projecting in a direction toward the inferior vertebra.

24. An apparatus for reducing a spondylolisthesis condition between an offset vertebra and an adjacent vertebra, comprising:

an elongated stem sized for introduction into the disc space between the offset and adjacent vertebrae;

an enlarged flange at one end of said stem, said flange having a bone contacting face configured to apply a force to the offset vertebra; and

a tool engagable to said elongated stem, said tool sized for manipulation outside the disc space to apply a pushing force communicated through said distraction device to the offset vertebra to reduce the offset vertebra relative to the adjacent vertebra.

25. The apparatus for reducing a spondylolisthesis condition according to claim 24, wherein said enlarged flange is integral with said elongated stem.

26. The apparatus for reducing a spondylolisthesis condition according to claim 24, wherein said enlarged flange is integral with said tool.

27. The apparatus for reducing a spondylolisthesis condition according to claim 24, wherein said elongated stem includes bone engaging surfaces to engage the offset and adjacent vertebrae to prevent slip between the vertebrae after the spondylolisthesis condition has been reduced.

28. The apparatus for reducing a spondylolisthesis condition according to claim 24, wherein said elongated stem includes opposite top and bottom surfaces and further includes a stop face projecting from said stem away from said bottom surface and configured for contacting the adjacent vertebra to prevent further reduction of the offset vertebra.

29. Laparoscopic instrumentation for performing surgical procedures between adjacent vertebrae, said instrumentation comprising:

a tubular sleeve having a longitudinal axis and a hollow interior along said axis sized for advancement of surgical tools from outside the patient's body to the adjacent vertebrae, said sleeve including a spike projecting from said sleeve substantially parallel to said longitudinal axis; and

a centering device including an elongated stem sized for introduction into the disc space between the adjacent vertebrae, said stem defining a bore sized to receive said spike of said tubular sleeve therethrough.



30. The laparoscopic instrumentation according to claim 29, wherein said bore is a keyed bore having a non-circular shape and said stem has a shape complementary to said keyed bore to prevent relative rotation between said sleeve and said centering device.

31. The laparoscopic instrumentation according to claim 29, wherein:  
said elongated stem of said centering device has a height sufficient to distract the disc space between the adjacent vertebrae; and  
said sleeve includes an extension projecting therefrom substantially parallel to said spike, said extension having a height substantially equal to the height of said elongated stem.

32. The laparoscopic instrumentation according to claim 29, wherein said sleeve includes a tubular wall and said spike extends contiguously from said wall.

33. The laparoscopic instrumentation according to claim 29, wherein said sleeve includes a tubular wall and said spike is attached to the outside of said wall.

34. The laparoscopic instrumentation according to claim 28, wherein:  
said sleeve includes a bore extending along the length of said sleeve; and  
said spike is sized for slidable passage through said bore in said sleeve.

35. An apparatus for implantation in the disc space between adjacent vertebrae, comprising:

at least two devices having elongated bodies sized for introduction adjacent each other in the disc space and including surfaces for engaging the adjacent vertebrae and defining a width less than a transverse dimension of the disc space, each of said devices having an end wall defining a threaded bore therethrough;

an elongated plate sized to be fully contained within the disc space, said plate having at least two bores defined therethrough and spaced apart a distance at least equal to said width of said devices; and

at least two set screws having a threaded stem sized to extend through each of said at least two bores and configured for threaded engagement with said threaded bore of a corresponding one of said devices.

36. The apparatus for implantation in the disc space between adjacent vertebrae according to claim 35, wherein:

said end wall of each of said devices defines a recess surrounding said threaded bore and a groove communicating with said recess; and

said elongated plate includes an enlarged portion surrounding each of said at least two bores and sized to be retained within said recess of each of said devices with said plate passing through said groove in each of said devices.

37. The apparatus for implantation in the disc space between adjacent vertebrae according to claim 35, wherein:

said elongated plate includes an intermediate plate extending outward from said elongated plate between said at least two bores, said intermediate plate defining at least one screw bore therethrough; and

the apparatus further includes a bone screw sized for passage through said screw bore in said intermediate plate.